

Remarks

In response to the Office Action mailed July 23, 2009 applicants request entry of the foregoing amendments, consideration of the following remarks and reconsideration of the rejections set forth in said office action.

The present invention is directed toward a mixture of isomers of dodecanethiol prepared by catalytic reaction of hydrogen sulfide with the trimer consisting essentially of n-butene in the presence of a catalyst. The mixture exhibits a diagram of distillation temperatures, at 19 millibar, such that point 50 is $123^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and that the difference in temperature between point 20 and point 80 is less than or equal to 4°C . Surprisingly, it has been found that the material and process according to the present invention leads to a different product than those disclosed in the prior art. This difference results from the use of tri(n-butene), and not a mixture of isomers as the reactant. The material and result of the process of the present invention is a homogeneity in behavior of the isomers of the mixture which is much greater than those of the prior art products. For example, the mixtures of the present invention have a point 50 which is substantially greater than the boiling point of the TDM of the prior art. When the mixture of the present invention is used as chain-transfer agent in radical polymerization reactions, the resulting polymers (or plastics) exhibit a significantly reduced viscosity. In addition, when it is used in the manufacture of polysulfides, the resulting material exhibits substantial differences with regard to viscosity. Such properties are particularly advantageous at a practical level. For example, they make possible faster forming of the plastic by standard injection molding techniques, thus allowing an increase in the productive output of lines for the production of molded objects. They also make it possible, for example in the case of a styrene/butadiene copolymer, to reduce the amount of transfer agent which is necessary for the manufacture of a copolymer having the required rheological property, for example for the purpose of its application as binding agent for the coating of paper.

As shown by the examples of the present application, when tri(n-butene), and not a mixture of isomers is used as the reactant, and the resulting dodecanethiol is used as a chain transfer agent, the viscosity of the resulting polymer is significantly reduced. See example 2 and comparative example 4. Also, when the dodecanethiol prepared in accordance with the

present invention is used in the preparation of di(tert-dodecyl) trisulfide, the resulting material exhibits a significantly reduced viscosity. See examples 6 and 8 and comparative examples 5 and 7 and the data presented in Table 2.

Claims 1-10 and 13-14 and 16-20 were rejected under 35 USC 103(a) as being unpatentable over Giacobbe (US 5,453,544) in view of Nierlich et al. (US 5,994,601). Applicants submit that neither Giacobbe '544 nor Nierlich et al. '601 singly or in combination render obvious the invention as presently claimed.

Giacobbe '544 discloses a process for making t-butylthiol by reacting hydrogen sulfide and an olefin having a carbon number of 3 to 15 in the presence of an acid catalyst. As noted by the examiner, Giacobbe '544 fails to disclose any distillation properties of the dodecanthiol mixtures prepared by the disclosed process. Applicants further submit that Giacobbe '544 fails to disclose a process which uses an olefin consisting essentially of n-butene as claimed in the present application. As shown by the comparative examples of the present application, the use of an olefin consisting essentially of n-butene results in a thiol having unique properties which result in polymers having significantly different viscosities when the unique thiol is used as a chain transfer agent. Applicants submit that Giacobbe '544 fails to include any disclosure that would lead a person of skill in the art to expect that the use of an olefin consisting essentially of n-butene will provide a thiol that, when used as a chain transfer agent will provide polymers with significantly lower viscosities.

Applicants submit that the general knowledge of the impact of molecular orientation and Van de Walls forces on boiling point noted by the examiner, when considered in view of Giacobbe '544 fails to render obvious the present invention. The generalized understanding of molecular orientation and Van der Waals forces on boiling point, fails to provide any teaching or suggestion that a dodecanethiol prepared olefin consisting essentially of n-butene will exhibit unique properties discovered by the present inventors such as, when used as a chain transfer agent will result in the formation of polymers having significantly lower viscosities.

Nierlich et al. '601 discloses a process for preparing butane oligomers from Fischer-Tropsch olefins. Applicants submit that Nierlich et al. '601 fails to disclose any distinction with

regard to the butane employed. Applicants submit that Nierlich et al. '601 actually directs a person skilled in the art that there is no distinction with regard to the described process between using n-butene, isobutene or a mixture of n-butene and isobutene. Applicants submit that even were it obvious to combine Nierlich et al. 601 and Giacobbe '544, which applicants submit is not the case, the present invention is not rendered obvious. Such a combination does not render obvious the use of an olefin consisting essentially of n-butene as claimed in the present application to provide chain transfers agents which result in polymers which exhibit unique, surprising and useful lower viscosity.

Applicants submit that neither Giacobbe '544 nor Nierlich et al. '601 singly or in combination render obvious the present invention and request that the rejection be withdrawn.

Claims 14 and 15 were rejected as prima facie obvious over Giacobbe '544 in view of Nierlich et al. '601. Claim 15 has been cancelled. Applicants submit that neither Giacobbe '544 nor Nierlich et al. '601 singly or in combination render obvious the invention as presently claimed.

As discussed above, neither Giacobbe '544 nor Nierlich et al. '601 provide any teaching, motivation or suggestion to employee an olefin trimer consisting essentially of n-butene in a catalytic reaction of hydrogen sulfide with the trimer to produce a mixture of isomers of dodecanethiol which exhibit specific physical properties which provide specific advantages when used, such as a chain transfer agents.

Claims 3, 17, 4, 18, 5, 6, 13, 19, 7-9, 20, 10 depend from and include each and every limitation of claims 1 or 14 as discussed above. Applicants submit that neither Giacobbe '544 nor Nierlich et al. '601 provide any teaching, motivation or suggestion to employee an olefin trimer consisting essentially of n-butene in a catalytic reaction of hydrogen sulfide with the trimer to produce a mixture of isomers of dodecanethiol which exhibit specific physical properties which provide specific advantages when used, such as a chain transfer agents.

Claim 11 was rejected under 35 USC 103(a) as being unpatentable over Giacobbe '544 in view of Nierlich et al. '601 and further in view of Hall et al. (US 5,545,677). Applicants

submit that Giacobbe '544 nor Nierlich et al. '601 nor Hall et al. '677 singly or in combination render obvious the invention as presently claimed. Claims 11 depends from, and includes all of the limitations discussed about with respect to claim 1.

Hall et al. '677 discloses a composition comprising an optically variable pigment modified with a silane functional compound and a copolymer. Hall et al. '677 discloses that use of mercaptans such as octyl mercaptan, n- or tert-dodecyl mercaptan, thiosalicylic acid, mercaptoacetic acid, and mercaptothioethanol; halogenated compounds, and dimeric alpha-methyl styrene as chain transfer agents. Applicants submit that Hall et al. '677 fails to include any disclosure of isomers of dodecanethiol prepared by catalytic reaction of hydrogen sulfide with the trimer consisting essentially of n-butene. Hall et al. '677 fails to disclose the unique properties of polymers formed when a mixture of isomers of dodecanethiol prepared by catalytic reaction of hydrogen sulfide with the trimer consisting essentially of n-butene is used as chain transfer agents. Applicants submit that Hall et al. '677 fails to remedy the deficiencies noted above with respect to Giacobbe '544 and Nierlich et al. '601 and the rejection should be withdrawn.

Claim 12 was rejected under 35 USC 103(a) as being unpatentable over Giacobbe '544 in view of Nierlich et al. '601 and further in view of Arretz (US 6,288,006). Applicants submit that Giacobbe '544 nor Nierlich et al. '601 nor Arretz '006 singly or in combination render obvious the invention as presently claimed. Claims 12 depends from, and includes all of the limitations discussed about with respect to claim 1.

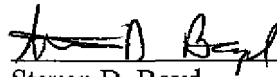
Arretz '006 discloses a method for pre-sulphurization of catalyst based on metal oxides, intended especially for the hydrotreating of hydrocarbon feedstocks. Arretz '006 discloses that polysulfides can be obtained via the reaction of a mercaptan with sulphur in the presence of a basic catalyst. Applicants submit that Arretz '006 fails to include any disclosure of a mixture of isomers of dodecanethiol prepared by catalytic reaction of hydrogen sulfide with the trimer consisting essentially of n-butene. Arretz '006 fails to disclose the unique properties of polymers formed when a mixture of isomers of dodecanethiol prepared by catalytic reaction of hydrogen sulfide with the trimer consisting essentially of n-butene is used as chain transfer agents. Applicants submit that Arretz '006 fails to remedy the

deficiencies noted above with respect to Giacobbe '544 and Nierlich et al. '601 and the rejection should be withdrawn.

Applicants submit that in view of the foregoing amendment and remarks, claims 1-14 and 16-20, are in condition for allowance and prompt favorable action is solicited.

Respectfully submitted,

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